



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 5  
77 WEST JACKSON BOULEVARD  
CHICAGO, IL 60604-3590

SEP 23 2001

REPLY TO THE ATTENTION OF

SR-6J

Mr. Al Howard  
Chief Executive Section  
Environmental Response Division  
Michigan Department of Environmental Quality  
P.O. Box 30473  
Lansing, Michigan 48909

Re: Gratiot County Landfill, St. Louis, Michigan  
Five-Year Review Report

Dear Mr. Howard:

The U.S. Environmental Protection Agency (U.S. EPA) has reviewed the Five-Year Review Report, developed by the Michigan Department of Environmental Quality for the subject site and concurs with the protectiveness statement. The report is hereby approved.

U.S. EPA appreciates the efforts of Brady Boyce of your staff in conducting this review. Please feel free to contact me if you have any questions.

Sincerely,

A handwritten signature in black ink, which appears to read "W. E. Muno", is positioned above the typed name of the signatory.

William E. Muno, Director  
Superfund Division

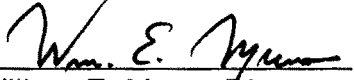
FIVE-YEAR REVIEW REPORT #3  
SEPTEMBER 2001

GRATIOT COUNTY LANDFILL SUPERFUND SITE

**CITY OF ST. LOUIS, GRATIOT COUNTY, MICHIGAN**

PREPARED BY:  
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Superfund Section  
Environmental Response Division  
Michigan Department of Environmental Quality  
September 2001

SUBMITTED TO:  
U.S. Environmental Protection Agency  
Superfund Division  
Region 5

  
William E. Muno, Director  
Superfund Division  
U. S. EPA Region 5

9/28/01

## **I. INTRODUCTION**

### **AUTHORITY STATEMENT AND PURPOSE**

The Michigan Department of Environmental Quality (MDEQ) conducted this site review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Section 121(c), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the National Contingency Plan (NCP) Section 300.400(f)(4)(ii), and OSWER Directives 9355.7-02 (dated May 23, 1991), 9355.7-02A (dated July 26, 1994), and 9355.7-03A (dated December 21, 1995). The purpose of this Five-Year review, which was conducted as a matter of policy, is to evaluate whether a completed remedial action remains protective of human health and the environment at sites where hazardous waste remains on-site at levels that do not allow for unlimited use and unrestricted exposure.

The five-year review process conducted for the Gratiot County Landfill Superfund site is applicable to a pre-1984 Record of Decision (ROD) site at which construction has been completed but regular activity continues at the site through continuing response work. This review and supporting documentation will become part of the site record and copies will be placed in the administrative record at the local site repository for the Gratiot County Landfill Superfund site in St. Louis, Gratiot County, Michigan. This Five-Year Review Report was prepared by the MDEQ using project file documents and information supplied by various contractors. Prior five-year reviews were conducted by the MDEQ in 1991 and 1996. Those Five-Year Review Reports were submitted to and approved by the USEPA.

## **II. SITE HISTORY, DESCRIPTION, AND CHRONOLOGY**

The Gratiot County Landfill (GCL) is a 40 acre landfill located on an 80 acre parcel of land in the southeast quarter of Section 30, Township 12 North, Range 2 West, Bethany Township, Gratiot County, Michigan. The landfill was operated in 1971 by Gratiot County Board of Public Works for the disposal of domestic, commercial and industrial solid waste. The Michigan Department of Environmental Quality (MDEQ) licensed GCL for operation in 1974. Because of violation of conditions of operation stipulated in the MDEQ permit, in 1976 the MDEQ initiated proceedings to revoke the GCL license. In late 1976, the United States Environmental Protection Agency (USEPA) notified the MDEQ that 269,000 pounds of polybrominated biphenyl (PBB) contaminated waste had been disposed at GCL from 1971 to 1974 by Michigan Chemical Company (Velsicol).

In 1973, the compound PBB became widely known when it was determined that livestock feed had been accidentally mixed with BP-6 (PBB), a flame retardant with the trade name Firemaster. The Firemaster material was manufactured by Velsicol at its St. Louis, Michigan facility. Velsicol also manufactured the product Nutrimaster, a

magnesium oxide based livestock feed additive. Due to mixing of the two products, Michigan livestock in the millions consumed PBB-laden feed, eventually necessitating their destruction. Additionally, to reduce additional exposure, tons of dairy products such as eggs, milk, butter, cheese, were also destroyed. This incident is considered one of the most costly and disastrous contamination incidents to have occurred in United States agricultural history and is estimated to have exposed 90 percent of Michigan residents to some level of PBB contamination.

Due to the information about PBB disposal at the GCL, and because stockpiles of the contaminated feed were discovered by the MDEQ on the surface on and around the GCL, a Remedial Investigation and Feasibility Study (RI/FS) was completed by MDEQ in 1980. The RI found PBB as well as elevated levels of other contaminants in shallow groundwater on and near the site. PBB was not detected in residential wells, surface drainage and nearby streams. The stockpiled feed was disposed of into the landfill.

### **III. SUMMARY OF REMEDY DECISIONS AND ENFORCEMENT**

Under a Consent Judgment (1982) with MDEQ and USEPA, which covered both the GCL and a separate location, Michigan Chemical Company, the responsible party, Velsicol, was ordered to pay cost recovery and to fund certain remedial actions. At the GCL site, Velsicol provided clay for a low permeability cover. The MDEQ hired a contractor to implement a remedial action. In 1984, the work initiated included test borings; constructing a slurry wall around the perimeter of the landfill, constructing burial cells inside the landfill to encapsulate the PBB-contaminated waste; excavation and disposal of approximately 20,000 cubic yards of PBB-laden waste from property located across the road; installing a perimeter fence around the landfill; capping the landfill with a compacted clay layer to reduce infiltration; and constructing a lagoon to collect and surface water runoff. Due to the settlement with Velsicol, ongoing and future operation, maintenance, and remedial action costs at the landfill are being funded by the State of Michigan.

### **IV. REMEDY PERFORMANCE / PROGRESS SINCE LAST FIVE-YEAR REVIEW**

In 1992, benzene was detected in monitor wells outside the slurry wall in the southwest corner of the GCL. Based on water elevations inside and outside the slurry wall, the MDEQ suspected breaches in the slurry wall. This prompted MDEQ to investigate the extent of contamination which may have migrated outside the slurry wall and also any potential impacts to human health and the environment. The MDEQ also conducted further hydro-geological study to define a narrow sand and gravel paleo-river channel underlying this area which could provide groundwater migration pathway away from the GCL.

Because of the elevated levels of volatile organic compounds (VOC's) detected in wells located outside the southwest slurry wall, the MDEQ installed a groundwater extraction and treatment system (GETS). The GETS has been operating since January 1999 to capture and treat the migrating VOC's in groundwater from the landfill. The installation of GETS is consistent with the prior five-year review recommendations. However, because the GETS utilizes air stripping, it captures but does not treat inorganics in the groundwater.

In 2000, MDEQ issued a contract to Harding ESE, Inc. to conduct an engineering assessment of the GCL. Tasks included an evaluation of the effectiveness of the landfill cap, the adequacy of the landfill gas venting, and the integrity of the slurry wall. The evaluation was able to better define the extent and location of the known slurry wall breach. A future task will be to develop cost estimates associated with slurry wall repair or replacement. The engineering assessment will also include a risk analysis, and evaluation of appropriate remedial alternatives including cost estimates for adding the capability to capture and treat the inorganic compounds in the groundwater. As an initial part of the study, residential wells around the GCL were sampled to ensure that no ongoing exposure from the landfill is occurring. One of the other objectives of the Harding study was to provide information necessary for the MDEQ and the USEPA to complete this five-year review. The information obtained to date has been summarized in various technical memoranda, including the Cap and Slurry Wall Assessment and the draft Landfill Containment Evaluation. The following summarizes preliminary field observations available at the time of this report. The final Engineering Assessment Report, will be provided to the USEPA when it is available.

## **V. PRELIMINARY ENGINEERING ASSESSMENT**

### **SLURRY WALL**

Tasks included the collection of soil borings in and around the slurry wall. It was determined that significant gaps between the bottom of the slurry wall and the basal clay layer are present along much of the southern wall and the southern half of the west wall. In this area the basal clay is at greater depth than the other areas of the slurry wall. It is speculated that the trenching equipment used for the slurry wall installation did not have the range to reach down and key into the basal clay in the southwest area. Other than these identified breach areas in the southwest corner the slurry wall appears to be in relatively good condition in most areas with permeability generally in the  $10^{-8}$  range. However, there is evidence that migration of a lesser extent is also occurring along the northern portion of the slurry wall.

### **LANDFILL COVER**

The field study identified areas of the cap where appreciable amounts of sand or silt were present instead of clay. The average permeability of the cap was determined to be  $3.3 \times 10^{-6}$  cm/sec. At the present time the cap is not functioning as an effective

permeability barrier. An evaluation of enhancing the cap with a geomembrane layer will be included as a future task. The field study identified some areas of the cap where surface water ponding, erosion, dead vegetation and animal burrows existed. These cap concerns will also be addressed in the final engineering assessment report.

A Hydrologic Evaluation of Landfill Performance (HELP) computer model was applied to an analysis of infiltration through the cap. The model estimates that 29.5% of the average annual volume of rainfall percolates through the cap and into the landfill, which leads to the conclusion that the cap is not functioning as an effective infiltration barrier.

#### LANDFILL GAS

The field study measured gas through temporary gas monitoring points. To date, landfill gas does not appear to be migrating from the landfill to any significant extent. The existing passive landfill vents appear to be in relatively good shape and will be further repaired and restocked with granular activated carbon for capture of gasses. Soil borings in the landfill did encounter pockets where landfill gas was under pressure. A future task of the engineering assessment will be the installation of permanent gas monitor points. The data will provide information as to the need for additional gas vents and the location and number of new vents. This evaluation will be provided in the final engineering assessment.

#### GROUNDWATER - Residential Wells

Seven residential wells around the GCL were sampled for VOCs, SVOCS, PCBs, pesticides and inorganics. Results indicate that residential wells have not been impacted due to site related contamination. Recent sampling results from the residential wells were below the generic residential cleanup criteria, pursuant to Part 201 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Part 201), for organic constituents, including VOCs, SVOCs, PCBs, and Pesticides. The inorganic constituents identified in the residential wells appear to be within background ranges. One of the residential wells showed levels of iron and manganese above Part 201, but due to its location generally upgradient, it is likewise believed these exceedences are not due to the landfill. All residents have been provided the analytical results from their respective well.

#### GENERAL GROUNDWATER - ORGANICS

An extensive network of well nests inside and outside of the slurry wall has been sampled on a regular basis since 1984. As would be expected, groundwater inside the slurry wall is at concentrations above Part 201. The only consistent evidence to date of groundwater contamination outside the slurry wall is at the southwest corner near nested groundwater monitor well G-13. Based upon the December 2000 annual sampling event, only diethyl ether is in excess of Part 201 for VOC's, and that is for the aesthetic standard. The concentration of diethyl ether is below the health based Part 201 standard. The most recent data obtained demonstrates that GETS is intercepting this plume. This conclusion is further supported by a review of capture zone water

elevations. Due to the low levels of groundwater VOC contaminants and the operation of the GETS, there is no current exposure of VOC's due to migration of groundwater from the GCL.

In the March 2001 round of quarterly GETS sampling, 1,2 Dichloroethane was detected at 5.7 ug/l, slightly above the Part 201 standard of 5 ug/l. However, the 2000 annual sampling event showed 1,2 Dichloroethane at below the Part 201 standard.

None of the VOC concentrations exceeded Part 201 Direct Contact Criteria, Residential Volatization to Indoor Air Inhalation, or to Acute Inhalation Screening levels.

#### GENERAL GROUNDWATER - SEMI-VOLATILES

December 2000 results indicate that bis(2-ethylhexyl)phthalate was detected in two wells outside the slurry wall above the Part 201 standard of 6 µg/L. These are OBS-5 (16 µg/L) and OW 26S (7 µg/L).

#### GENERAL GROUNDWATER - INORGANICS

Inorganic compounds identified most frequently at concentrations exceeding Part 201 criteria include chloride, iron, sodium, manganese, zinc and ammonia. To a lesser degree, exceedences above Part 201 have occurred for arsenic, cadmium, and lead. Chloride concentrations exceeding Part 201 were observed at 31 locations within and outside the containment area. The wells along the southwestern corner of the landfill show the highest and most consistent levels of chloride contamination. These elevated chloride levels are likely a result of the formation and migration of leachate in the landfill. It should be noted that the chloride levels exceed the Part 201 aesthetic standard, but there is no established health-based standard at this time.

In every sampling event, iron was detected above the Part 201 aesthetic standard at most locations. The elevated iron levels are consistent with naturally occurring background levels for the area.

Sodium concentrations exceeding Part 201 were observed at a number of locations in the northern and southwestern portions of the site. These exceedences are likely attributable to leachate migration from the landfill.

Elevated manganese concentrations above Part 201 were reported at 26 locations around the landfill. No trend or pattern is apparent in the distribution of manganese. The elevated levels of manganese are believed to reflect background levels for the area but that will need to be confirmed by additional background sampling.

Ammonia levels exceeding Part 201 were present at most sample locations. The widespread elevated ammonia levels might be attributed to the use of fertilizers in the area, as land use around GCL is predominantly agricultural. It should be noted, however, that levels of ammonia within the containment area of the landfill and to the

southwest of the landfill are at least one order of magnitude higher than levels elsewhere around the GCL. Ammonia concentrations exceeding Part 201 were observed at four locations, OBS-1, OBS-2, G-16d and EW-5. Increased ammonia levels in groundwater in the landfill and southwest of the site may be from leachate formation and migration.

There were also exceedences above Part 201 for arsenic, cadmium, lead and zinc at various locations. Elevated arsenic levels were observed at six locations (EW-5, EW-12, EW-17, G-13d, OBS-1 and OBS-2) during the December 2000 sampling event. Cadmium concentrations above Part 201 were reported at two locations (EW-5 and OW-26s). The levels were abnormally high and do not coincide with any type of plume pattern. Lead concentrations at 10 locations along the north (G-19 and G-20) and west (EW-5, G-13d, G-13s, G-15, G-16d, G-17s, OW-26d and OW-26s) side of the site exceeded DWL. Zinc above Part 201 was identified at 11 locations around GCL (DW-1, EW-3, G-1, G-7d, G-12s, G-13s, G-17d, G-17s, G-19d, OW-26s and OW-26d). No apparent trend or pattern is evident from the data observed.

None of the inorganic concentrations exceeded Part 201 Direct Contact Criteria, Residential Volatilization to Indoor Air Inhalation criteria, or to Acute Inhalation Screening levels at any time.

## **VI. SITE VISITS AND COMMUNITY RELATIONS**

The MDEQ and their contractors have been frequent visitors to the GCL since the last five year review due to the installation and monitoring of the GETS system and the ongoing engineering assessment being performed by Harding. The EPA conducted a site visit for purposes of this five year review on March 22, 2001. The MDEQ has established a repository for site related information at the city library in St. Louis. When the engineering assessment is finalized it will be provided to the repository. The MDEQ has held a number of public meeting over a period of years to present information and to discuss site issues with local residents.

## **VII. FUTURE ACTIONS AND RECOMMENDATIONS**

The MDEQ will conduct the following activities to maintain and enhance the protection of human health and the environment at the GCL site.

1. Continue the annual site-wide groundwater monitoring program.
2. Continue to operate the GETS system until a long term solution has been determined, and continue the quarterly GETS monitoring.



3. Evaluate remedial alternatives, including all, or a combination of, the following:
  - a. Repair or replacement of the slurry wall, improvements to the landfill cover, and installation of additional methane gas vents;
  - b. Enhancement of the GETS to add the capability to treat inorganic compounds, or the addition of a separate system to capture and treat the groundwater inorganic compounds.
  - c. Operation of the GETS system on an intermittent basis (standby status) should groundwater monitoring warrant the effectiveness of doing so;
  - d. Evaluate the overall landfill status to determine additional necessary repairs and enhancements which would increase the cost-effectiveness of operation and further ensure protection of human health and the environment.

## **VIII. CONCLUSIONS**

Groundwater migrating outside the slurry wall exceeds the Part 201 residential drinking water aesthetic standard for diethyl ether but is below the health based standard. Inorganic compounds in the groundwater outside the slurry wall are above Part 201 although the GETS is capturing a significant volume of the migrating groundwater and returning it to the evapotranspiration pond on-site, there is no effective treatment now in place. The only evidence of significant contaminant migration from the landfill is in the southwest corner where breaches have been identified. Residential drinking water well sampling supports the conclusion that there is no impact to nearby residential wells from site related contamination at this time.

## **IX. STATEMENT OF PROTECTIVENESS**

Staff of the MDEQ have determined that the initial remedy implemented for this site continues to contribute to the protection of human health and the environment. Releases from the landfill which are occurring are not currently impacting any known human receptors - immediate threats have been controlled. An engineering assessment is currently underway to further define site related problems and to evaluate appropriate remedial alternatives to bring this site into compliance with federal and state requirements that are legally applicable, or relevant and appropriate (ARAR's). The current site remedy is not inconsistent with potential future remedial actions.

## **X. NEXT REVIEW**

The next five-year review for the Gratiot County Landfill site will be completed by the MDEQ prior to September 30, 2006, the twentieth year after the initial remedial action.